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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/549,621

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Dirk Breidt

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EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

05/12/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/549,621	<b>Applicant(s)</b> BREIDT ET AL.	
	<b>Examiner</b> MATTHEW J. SONG	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 8-16 is/are pending in the application.  
     4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/19/2005</u> .   | 6) <input type="checkbox"/> Other: ____.                          |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement filed 9/19/2005 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. None of the foreign references or non-patent literature publications have been supplied. Copies supplied to the European PCT office is not sufficient.

### ***Claim Objections***

2. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not). Claims 1-7 are cancelled and Claims 8-16 are listed as new, however the previous claim listing has claims 1-20. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 1792

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 8-10 and 14-16 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ali et al ("Promoting secondary nucleation using methane modulations during diamond chemical vapor deposition to produce smoother, harder and better quality films").

Ali et al teaches a substrate made of silicon and a layer of nanocrystalline diamond (nano-sized polycrystalline diamond grains) (pg 297-98).

Art Unit: 1792

As to the limitation regarding the surface of the layer having a surface roughness less than the surface roughness of the substrate surface, Ali et al does not explicitly teach the surface roughness of the substrate. Ali et al teaches the silicon substrate is abraded with diamond powder having a diameter of 2-4  $\mu\text{m}$ ; therefore the surface of the substrate inherently has a roughness greater than 0.25  $\mu\text{m}$  (roughness of the surface layer) because the abrasive grain size is larger than the roughness of the surface layer. Also, Ali et al also teaches secondary nucleation led to successful filling of surface irregularities found on the film profile (pg 298 and Fig 6b); therefore a silicon substrate with a rough diamond layer and a smoother diamond layer is deposited on the substrate by filling the irregularities. Furthermore, the feature is inherent because Ali et al teaches a similar method of alternating between a higher carbon oversaturation concentration and a lower oversaturation concentration, as taught by applicant to obtain a nanocrystalline diamond with a surface roughness less than the surface roughness of the substrate; therefore a similar method inherently produces a similar effect. In the alternative, it would have been obvious to one of ordinary skill in the art to produce a diamond film with a surface roughness less than the roughness of a substrate.

Referring to claim 9-10, Ali et al discloses a smoother surface with a roughness of 0.25  $\mu\text{m}$  (pg 298).

Referring to claim 14, Ali et al discloses the growth mode is not the typical columnar type (pg 299).

Referring to claims 15-16, Ali et al teaches pulsing between different methane concentrations to produce a smooth diamond film (pg 297-98 and Table 2); therefore each subsequent pulse represents an additional layer formed on the nanocrystalline diamond layer. Ali

Art Unit: 1792

et al teaches alternating between a methane concentration of 4% and 3%, this reads on applicant's higher and lower over-saturation carbon containing atmosphere. The surface roughness limitation is discussed above.

6. Claims 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ali et al ("Promoting secondary nucleation using methane modulations during diamond chemical vapor deposition to produce smoother, harder and better quality films") as applied to claims 8-10 and 14-16 above, and further in view of Chen et al ("Growth of highly transparent nanocrystalline diamond films and a spectroscopic study of the growth").

Ali et al teaches all of the limitations of claim 11, as discussed above, except the crystals are between 5 and 100 nm in size. Ali et al also teaches using microwave plasma CVD. Ali et al also teaches polycrystalline diamond (unordered) and is silent to the crystals having a texture, thus clearly suggests untexturized crystals.

In a method of making nanocrystalline diamond, note entire reference, Chen et al teaches diamond films with a grains size of from 4nm to a few hundred nanometers were grown by microwave plasma enhanced chemical vapor deposition (Abstract). Chen et al also teaches the surface roughness is directly related to the grain size of the films deposited at low methane fractions (pg 758).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Ali et al by producing a diamond with small grain between 5 and 100 nm, as taught by Chen et al, to produce a highly smooth diamond.

Art Unit: 1792

7. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ali et al ("Promoting secondary nucleation using methane modulations during diamond chemical vapor deposition to produce smoother, harder and better quality films") as applied to claims 8-10 and 14-16 above, and further in view of Tanabe et al (US 5,567,522).

Ali et al teaches all of the limitations of claim 12, as discussed above, except the body being a tool. Ali et al teaches a silicon substrate with a diamond film.

In a method of making a tool, note entire reference, Tanabe et al teaches a diamond cutting tool member with a silicon base material and a diamond layer formed on the base material (col 4, ln 1-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Ali et al to form a useful cutting tool, as taught by Tanabe et al.

Referring to claim 13, a cutting tool clearly suggests a machining tool.

### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. SONG whose telephone number is (571)272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1792

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song  
Examiner  
Art Unit 1792

MJS  
May 10, 2009

/Robert M Kunemund/  
Primary Examiner, Art Unit 1792